WHAT IS CLAIMED IS

1. A semiconductor device comprising:

a collector layer;

a base layer of a carbon-doped $Ga_xIn_{1-x}As_ySb_{1-y}$ layer having one surface connected to the collector layer;

an emitter layer connected the other surface of the base layer;

a base contact layer of a carbon-doped GaAsSb layer electrically connected to the base layer; and

a base electrode formed on the base contact layer.

2. A semiconductor device according to claim 1, wherein

the base contact layer is formed on said one surface or said the other surface of the base layer.

3. A semiconductor device according to claim 1, wherein

the base contact layer is formed on a surface of the collector layer connected to the base layer and has a side surface connected to a side surface of the base layer.

4. A semiconductor device according to claim 1, wherein

the base contact layer is formed on a surface of the emitter layer connected to the base layer and has a side surface connected to a side surface of the base layer.

5. A semiconductor device according to claim 1, further comprising

a surface passivation layer for protecting the base contact layer formed on the surface of the base contact layer with the base electrode formed on.

6. A semiconductor device according to claim 1, wherein

the base contact layer is formed of a carbon-doped GaInAsSb layer in place of said carbon-doped GaAsSb layer.

7. A semiconductor device according to claim 1, wherein

an As composition y of the $Ga_xIn_{1-x}As_ySb_{1-y}$ is 1, so that the base layer is formed of a InGaAs layer.

8. A semiconductor device according to claim 6, wherein

an As composition y of the $Ga_xIn_{1-x}As_ySb_{1-y}$ is 1, so that the base layer is formed of a InGaAs layer.

9. A semiconductor device according to claim 1, wherein

an In composition x of the $Ga_xIn_{1-x}As_ySb_{1-y}$ is 0, so that the base layer is formed of a GaAsSb layer.

10. A semiconductor device according to claim 6, wherein

an In composition x of the $Ga_xIn_{1-x}As_ySb_{1-y}$ is 0, so that the base layer is formed of a GaAsSb layer.

11. A semiconductor device according to claim 1, wherein

a dopant concentration of the base contact layer is

not less than 1×10^{20} cm^{-3}.

12. A semiconductor device according to claim 6, wherein

a dopant concentration of the base contact layer is not less than 1×10^{20} cm^{-3}.

13. A method for fabricating a semiconductor device comprising the steps of:

forming a first semiconductor layer on a semiconductor substrate;

forming a base layer of a carbon-doped $Ga_xIn_{1-x}As_ySb_{1-y}$ layer on the first semiconductor layer;

forming a second semiconductor layer on the base layer;

patterning the second semiconductor layer in a mesa-shape;

forming a base contact layer on the base layer exposed by patterning the second semiconductor layer; and

forming a base electrode on the base contact layer.

14. A method for fabricating a semiconductor device according to claim 13, further comprising, after the step of patterning the second semiconductor layer, a step of removing the base contact layer in a exposed region which is exposed by patterning the second semiconductor layer, wherein

in the step of forming the base contact layer, the base contact layer having a side surface connected to the

base layer is formed on the first semiconductor layer exposed by removing the base layer.

15. A method for fabricating a semiconductor device according to claim 13, wherein

in the step of forming the base layer, the base layer of an InGaAs layer which corresponds to the $Ga_xIn_{1-x}As_ySb_{1-y}$ layer whose As composition y is 1, or a GaAsSb layer which corresponds to the $Ga_xIn_{1-x}As_ySb_{1-y}$ layer whose In composition X is 0 is formed.

16. A method for fabricating a semiconductor device according to claim 14, wherein

in the step of forming the base layer, the base layer of an InGaAs layer which corresponds to the $Ga_xIn_{1-x}As_ySb_{1-y}$ layer whose As composition y is 1, or a GaAsSb layer which corresponds to the $Ga_xIn_{1-x}As_ySb_{1-y}$ layer whose In composition X is 0 is formed.

17. A method for fabricating a semiconductor device according to claim 13, wherein

in the step of forming the base contact layer, the base contact layer is formed of a material which lattice-matches with a material forming the base layer.

18. A method for fabricating a semiconductor device according to claim 13, wherein

in the step of forming the base contact layer, the base contact layer is formed of a carbon-doped GaAsSb layer or a carbon-doped GaInAsSb layer.

19. A method for fabricating a semiconductor device according to claim 14, wherein

in the step of forming the base contact layer, the base contact layer is formed of a carbon-doped GaAsSb layer or a carbon-doped GaInAsSb layer.

20. A method for fabricating a semiconductor device according to claim 13, further comprising, before the step of forming the base contact layer, a step of thermal-treating for eliminating hydrogen in the base layer.

21. A method for fabricating a semiconductor device according to claim 13, further comprising, after the step of patterning the second semiconductor layer,

a step of forming a sidewall insulation film on a side wall of a mesa of the second semiconductor layer.

22. A method for fabricating a semiconductor device according to claim 14, further comprising, after the step of patterning the second semiconductor layer,

a step of forming a sidewall insulation film on a side wall of a mesa of the second semiconductor layer.

23. A method for fabricating a semiconductor device according to claim 13, further comprising, after the step of forming the base contact layer,

a step of forming a surface passivation layer on the base contact layer for protecting the base contact layer.

24. A method for fabricating a semiconductor device according to claim 14, further comprising, after the step

of forming the base contact layer,

a step of forming a surface passivation layer on the base contact layer for protecting the base contact layer.

25. A method for fabricating a semiconductor device according to claim 13, wherein

the first semiconductor layer or the second semiconductor layer is an emitter layer of an InP layer.

26. A method for fabricating a semiconductor device according to claim 14, wherein

the first semiconductor layer or the second semiconductor layer is an emitter layer of an InP layer.